Response to Scientific Peer Review Comments on the Draft Basin Plan Amendment for Mercury in the Cache Creek Watershed from Dr. Fiona Doyle, Donald H. McLaughlin Professor of Mineral Engineering, University of California, Berkeley.

Dr. Doyle provided her comments on 18 January 2005

Dr. Doyle's comments are in bold type. Responses by Regional Board staff are in plain text.

Overall, I am pleased to support the principles of the California Regional Water Quality Control Board, Central Valley Region's proposed amendment to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins for the Control of Mercury in Cache Creek, Bear Creek, Sulphur Creek and Harley Gulch. There is a sound rationale in proposing water quality objectives that are based directly on the concentration of methylmercury in fish. I support the identification of Implementation Alternative 2 as the most cost-effective approach for achieving the water quality objectives in a realistic time frame. As discussed below (in the format that I was asked to follow), I do have reservations about the apparently arbitrary assignment of allocations to mines in the different watersheds, and about the wisdom of one of the remediation strategies suggested in this amendment.

Determination of "whether the scientific portion of the proposed rule is based upon sound scientific knowledge, methods and practices" for the following issues:

1. **The derivation of a linkage between methylmercury in water and fish.**

Although this is not my area of technical specialization, the appendices to the proposed amendment make a convincing case for a direct relationship between the concentrations of methylmercury in water and fish. Accordingly, it follows that reducing methylmercury in water should achieve the desired reduction of methylmercury concentrations in fish.

No response necessary.

2. **Methods of analysis of total mercury loads and conclusions drawn from the analysis.**

Overall, the adopted methodologies appear sound. However, in assessing water budgets for Harley Gulch, estimates for the contributions of the west and east branches are made on the basis of area. It is possible that the drainage from the two mines in the western watershed includes groundwater (insufficient information is provided on the topography, ground water level, and the mines themselves to confirm or disprove this hypothesis). If so, the flow from the west branch would be higher than estimated, with a correspondingly higher overall load of mercury.

Regarding the Harley Gulch water budget, it is possible that there is a ground water component to drainage from the West Branch Harley Gulch that contributes mercury in addition to the surface runoff. The same could be said for the East Branch, although mercury concentrations in West Branch groundwater might expected to be higher because of the mineralized zone. Staff lack data on the groundwater topography needed to evaluate the hypotheses. Tetra Tech EM, Inc. (2004) characterized the mercury discharge from Abbott and Turkey Run as primarily due to erosion, with a small contribution from the Turkey Run thermal spring. Mobilization of mercury by groundwater passing through significant mine-related features on the site (e.g., the large calcined tailings pile near the creek) would be expected to be controlled by remediation of those sites.

In addition, I was astounded by the huge amount of mercury in Cache Creek that was not attributed to any specific source. Although this is acknowledged, it does suggest that the uncertainties in the mercury budget may be significantly greater than are acknowledged. In addition, this inability to identify the source of such a large proportion of the mercury severely undermines the rationale for some of the more drastic measures that are proposed.

Staff determined that the large mercury loads that do not seem to come directly from the mine sites or thermal springs. Regional Board staff has conducted two surveys of mercury in bed and banks of Cache Creek and the mouths of tributaries from the confluence with North Fork to Bear Creek. Staff will continue investigations to further characterize inputs of mercury to Cache Creek other than the mines and dam releases. The sediment surveys (Appendix D of the draft Staff Report) suggest that enrichment of mercury in Cache Creek banks begins downstream of Harley Gulch and continues downstream. Several tributaries to the canyon also contain sediment with elevated mercury concentrations, but erosion from these small watersheds is not thought to contribute a major portion of the unidentified sources.

It is possible that releases from mine sites were underestimated because of the lack of data for some high flow events. Additional data collected in high flow events could strengthen the aqueous mercury concentration versus flow relationships for tributary sites (North Fork Cache Creek, Bear Creek, and Harley Gulch) and refine the load estimates from the mines. Staff expects, however, that more data collection will not significantly reduce the estimate of a large mercury load coming from the Cache Creek canyon between Harley Gulch and Bear Creek. Two points support this statement.

1. Estimates of erosion from mine sites provide a check of mine-related tributary load estimates. Churchill and Clinkenbeard (2004) estimated total mercury loads (annual average) based on estimates of yearly erosion from various site features. Their calculations included precipitation, soil mercury concentrations, and use of the Revised Universal Soil Loss Equation. Churchill and Clinkenbeard estimated annual delivery of 1-10 kg/yr mercury from Abbott and Turkey Run mines to Harley Gulch, not including mass erosion from undercutting of the calcined tailings piles. The staff estimate of 7 kg/yr is within this range.

2. During the water years used for the Cache Creek mercury budget, which had average or low annual flow with no significant mass erosional events observed on mine sites, the calculations still indicate a large load coming from the canyon area. The Regional Board is continuing investigations in the canyon to characterize the source(s). The canyon load

may come from ungauged tributaries, mercury from mine operations previously deposited in floodplains, or other sources.

Whether discrete "hot spots" or areas with highly elevated levels of mercury in soil (such as >10 mg/kg) are identified in stream beds or banks will determine the level of remediation that is pursued. For example, if all floodplain terraces in Cache Creek between Harley Gulch and Rumsey are diffusely enriched with mercury previously discharged from mines, Regional Board staff anticipates that concerns over environmental disturbance and cost would preclude much remediation. If hot spots are found below tributaries such as Harley Gulch or Davis Creek, it may be possible to remove or stabilize the highly enriched material. The draft Basin Plan Amendment proposes that stream beds and banks be further studied. Feasibility studies and possibly remediation would only be required if hot spots are identified.

3. Sediment goals for Sulphur Creek, established on concentrations of mercury in natural "background" soil and soil in mineralized zones.

Overall, the sediment goals appear to be sound, although it would have been good to have seen some scientific discussion for the numeric targets that have been proposed.

The sediment targets for Sulphur Creek are based on the best available data regarding soil concentrations of mercury in the watershed. A preliminary target for mineralized zones is proposed in the TMDL report. This target is intended to be refined for individual mine sites as additional data are gathered during a feasibility study. The Sulphur Creek TMDL targets are intended to approximate pre-mining conditions. Soil in non-mineralized zones has 0.1-0.2 mg/kg mercury in fine-grained soil/sediment, based on samples collected on the ridge of the watershed away from springs or mines (Churchill and Clinkenbeard, 2004) and prospecting conducted in the 1980s in the lower Sulphur Creek watershed (Pearcy and Petersen, 1990).

The sediment goals are intended to be applied to soil from the mine sites that erodes into the creek. Predicting the associated total mercury concentrations is difficult. Concentrations of mercury in storm-related flows in Sulphur Creek depend on concentration and mass of soil eroding. In dry periods, mercury concentrations are driven by thermal spring discharges.

4. Effectiveness of proposed implementation actions in achieving the desired mercury reductions, as follows:
a. Reducing inorganic mercury loads

First, it is impossible to assess whether or not the proposed implementation actions will reduce the inorganic mercury loads as projected. According to Table 3.6 of the Cache Creek TMDL, on average 349 kg/year of the 400 kg/year of inorganic mercury in Cache Creek at Rumsey comes from unknown sources. There is no evidence that the proposed reduced allocations will achieve anything like the required reduction in total mercury at the Sacramento-San Joaquin delta.

Staff agrees that reductions in total mercury loads as seen at the Cache Creek Settling Basin inflow may be difficult to measure, given the large loads coming from stream beds and banks that contain mercury. Staff expects that load reductions will be observed closer to the mine sites, such as within Harley Gulch, Sulphur Creek and Bear Creek. Time to achieve substantial load reductions at the mouth of Cache Creek will be long and depends in part on natural erosion of sediments containing mercury. Progress will be made, in part, toward mercury reductions required under the San Francisco Bay TMDL through this TMDL, which addresses ongoing inputs of mercury-enriched soil/sediment, and the Delta TMDL, which will include proposals for continued operation and potential improvements to the Cache Creek Settling Basin.

Second, I do not grasp the rationale for assigning a blanket 5% allocation for all mines, with little documentation of the conditions at, and characteristics of, each mine. From a scientific perspective, it would appear more sensible to identify those sources where the largest reduction in mercury load could be achieved most readily.

Staff agrees that it is logical to focus attention on mine sites with highest mercury loads and feasibility of control. This prioritization will occur in the order in which Regional Board staff works with property owners on issuing cleanup orders and developing remediation plans. The Regional Board will determine specific requirements for each mine site after feasibility studies are conducted. An initial priority is the Abbott/Turkey Run site, which has the highest estimated annual input of mercury. Containment of waste piles and control of erosion on the site would not be technically difficult.

From a regulatory perspective, as one intent is to reduce the mercury loads from the sites as close to pre-mining conditions as possible, it is difficult to justify a 95% reduction for one site and a lesser reduction for a different, smaller site. If a feasibility study suggests that remediation of a site would be ineffectual in reducing creek mercury loads or is cost-prohibitive, the Regional Board could amend the Basin Plan requirements.

Third (P40), it is not necessarily valid to assume that a 95% reduction in mercury releases from mines can be achieved, just because this was done for copper and zinc mines in the Central Valley. The mechanism for metal mobilization and release is different.

Perhaps this was not the best comparison, as the mechanisms for mobilization of copper, zinc, and mercury are different. Nevertheless, staff expects that remediation of the mine sites can be highly successful through methods to control erosion.

Fourth, I am uncomfortable with the suggestion at a couple of places that streambed contamination might be addressed by allowing sediment with low concentrations of mercury to replace or bury contaminated material in the streambed. This arrangement is intrinsically unstable, and would appear to be guaranteed to release high levels of mercury during rare, but exceedingly heavy storms when unusual amounts of streambed erosion occur.

Dr. Doyle is correct that sediment enriched with mercury that becomes buried may be remobilized in a heavy storm. The implementation plan now describes the expected, gradual movement of mercury-enriched sediment through and out of the Cache Creek system by natural erosion, instead of an expectation of partial burial.

b. Reducing methylmercury loads, and

Although I am not an expert on wetlands, I was not convinced of the feasibility of regulating that new water impoundments or wetlands produce no net increases in methylmercury loads. There was no compelling evidence that this can be done. Accordingly, I believe that there should be serious consideration of the relative benefits of wetlands and the damage that they can cause when fed by water with high levels of mercury.

Staff agrees that creation of wetlands in a mercury-enriched watershed and the potential for wildlife attracted to the wetlands to be exposed to high levels of methylmercury in prey are serious concerns. Staff urged riparian managers to consider methylmercury exposure within the wetland when planning new wetlands. Although staff is concerned about methylmercury risks in off-channel wetlands, the Basin Plan Amendment will not regulate methylmercury levels in off-channel wetlands or impoundments. The proposed Basin Plan Amendment does prohibit a surface water discharge from a new impoundment or wetland from increasing the concentration of methylmercury in Cache Creek. This may be accomplished by eliminating discharge, matching aqueous methylmercury concentrations in the wetlands and creek to time the discharge, or possible future improvements in methods of wetland management.

c. Reducing fish tissue concentrations of methylmercury?

Here, there does, indeed, appear to be a sound scientific rationale for the proposed amendment.

No response necessary.

5. Estimates of time that must pass until mercury levels in sediment discharged from the Cache Creek canyon reach pre-mining conditions

On the basis of recent data, the Regional Board staff estimate of 300-500 years before sediment concentrations approach pre-mining conditions appears reasonable. However, although this is not my area of expertise, it would appear that this estimate is highly sensitive to climatic changes. It appears that most sediment movement and erosion occurs during major storms. Changes to the storm patterns could radically change the overall patterns of erosion.

Staff agrees.

6. Overarching questions

(a) I am concerned by the possibility that the proposed arbitrary assignment of 5% loads from mines may cause unnecessary expense, with negligible impact on water quality. There are huge differences in conditions at inactive mines in terms of drainage, topography, waste management practices, etc. It may well be the case that at some of the

mines, with little waste rock in contact with runoff, a 95% reduction in mercury release would take releases to below those that would occur for undisturbed property in mineralized zones. In contrast, for others, it might be easy to achieve a 99% reduction. If one compares the Elgin Mine, responsible for (relatively) high discharges of mercury, with the Wide-Awake Mine, which discharges miniscule amounts, it would appear that a 95% reduction in discharge from the former is highly desirable, while a 95% reduction from the latter would have no impact whatsoever on water quality. Yet the cost estimates for these two properties show that the Elgin mine owners would incur significantly lower costs than Wide-Awake Mine owners. At the end of the day, when the Elgin Mine Owners would presumably be patted on the back for their efforts, they would appear to be discharging more mercury than the Wide-Awake Mine is *now* discharging. There seems no justification for such an arbitrary approach.

As noted in the response to the second point in Comment 4, there may be valid technical and economic reasons for focusing cleanup efforts on a subset of the mine sites. When drafting the Basin Plan Amendment, Regional Board staff did not feel that sufficient information was available for detailing different mine site cleanup requirements. A first step for each site will be a feasibility study, which should evaluate pre-mining conditions and further examine cleanup options and costs. The Regional Board will take this information into account when approving cleanup plans and can adjust the Basin Plan if necessary.

(b) Taken as a whole, considering merely the water quality goals, without the details of how to achieve them, the proposed amendment seems sound.

No response necessary.

Specific Comments on Appendices

Cache Creek, Bear Creek, and Harley Gulch TMDL for Mercury (Staff Report - September 2004)

Section 2.3.3. This is most confusing to read. First, this section starts on the second page 10 (appearing directly after P21). Second, it refers to an equation 3-1, and I can find no numbered equation. Third, it refers to Tables 3.1, 3.2 and 3.4, which appear in the next chapter, and have nothing to do with the subject of this section.

Staff appreciates these and other editorial corrections.

Section 3. Pagination problems arise again, with a jump from 25 to 34.

Section 6, pp. 90-91. Assigning load allocations of five percent of existing inputs of total mercury from mines draining into Bear Creek and Harley Gulch seems a somewhat questionable strategy, given that it is acknowledged that little is known about the mines, and that the effect on the total loading of Upper Cache Creek would be miniscule. It will be exceedingly costly to achieve such a drastic percentage reduction in mercury output from the mines. Would it not be far more cost effective to identify the "unidentified" source of mercury, and achieve a relatively small percentage reduction in this? At the very least, I would suggest formally providing flexibility to implement those strategies that can accomplish the overall water quality goals in as cost effective a manner as possible.

Under the proposed implementation plan, Regional Board staff would continue to characterize stream beds and banks in Sulphur Creek, lower Bear Creek, and the Cache Creek canyon. The purpose of these efforts is to evaluate what Dr. Doyle suggests – a site or sites where it would be feasible to remove or stabilize the mercury-enriched material in order to reduce the loads from the canyon area. Although these sites have not been identified, costs for remediation may be similar to or greater than mine site cleanups.

One important reason for including mine sites in the implementation plan, despite low estimates of annual loads, is to secure mercury remaining on the sites from being transported into the creeks in an extreme erosional event. Churchill and Clinkenbeard (2004) estimate that there are 33,000-53,000 kg mercury in tailings and waste rock piles on the Harley Gulch, Sulphur Creek, and Bear Creek sites.

P91: I don't follow the sentence, "Another component of the implementation plan might include a program to reduce the mercury related risk to humans consuming mercury contaminated by public outreach and education." Outreach and education shouldn't contaminate mercury.

P96: "Alternative to erosion control or removal within the lower basin, methods to facilitate burial of more contaminated sediment under sediment that is less contaminated or contains regional background levels of mercury." My concern with this strategy lies in

the potential for the less contaminated layer to be washed out during flood events, once more exposing sediment with high concentrations of mercury.

As described in response to the fourth point in Comment 4, the draft Basin Plan Amendment implementation plan does not promote sediment burial.

Sulphur Creek TMDL for Mercury (Draft Staff Report - August 2004)

Executive Summary, Piii: "Inactive mine sites themselves are assigned a specific allocation of no more than 5% of existing mine-related loads entering the creek from each site." From Table ES.1, it appears that these mines are assigned an allocation of no *less* than *10%.* Although this ambiguity is clarified in section 5.2, it is extremely unclear in the executive summary.

Section 2, pp. 21 and 25. It isn't clear which line is which on Figures 2.4, 2.5 or 2.6.

Regional Board Staff's response to comments from Scientific Peer Reviewer, Dr. David Sedlak, Professor of Civil and Environmental Engineering, UC. Berkeley.

For Dr. Sedlak's complete comments, please refer to his letter to the Regional Board dated 3 January 2005. Summaries of his comments are in italics. Regional Board responses are in plain text.

Comment #1. General Impressions

Dr. Sedlak raises issues regarding selection of the linkage correlations, filtered versus aqueous raw methylmercury, and effects of season or flow rate on calculations of average conditions and mercury budgets. He suggests that possible refinements (Comments 2-5) be incorporated through adaptive management. Regional Board staff considered these issues during development of the TMDL. To a large extent, data are not available for the Cache Creek watershed to fully evaluate various options. The ability to incorporate new information and refinements in calculations is the purpose of periodic review of the Basin Plan Amendment and the adaptive management approach. Staff agrees with Dr. Sedlak that continuing to work with the issues discussed below is beneficial for this and other TMDLs.

Comment # 2. Linkage between methylmercury (MeHg) in water and fish.

Dr. Sedlak commented that variations in bioaccumulation related to sites (such as differences between Harley Gulch and lower Cache Creek) should be taken into account in identifying the linkage between aqueous and biotic MeHg.

Dr. Sedlak is correct that the correlation between concentrations of methylmercury (MeHg) in invertebrates and water (unfiltered) used data from all sites in the Cache Creek watershed sampled by Slotton *et al.* (2004). This is the correlation reprinted as Figure 4.1 of the TMDL report. These sites include Sulphur Creek and Harley Gulch downstream of inactive mines and Bear Creek, which seemed to exhibit higher bioaccumulation rates than other sites. The lack of a perfect correlation in the water-invertebrate relationship ($R^2 = 0.63$) indicates that factors other than the aqueous MeHg concentration influence biotic MeHg levels. Staff acknowledges that the role of these factors may be different at the mines versus main stem creek sites. The strong correlations between total aqueous MeHg and invertebrates MeHg and between MeHg in invertebrates and large, piscivorous fish, suggest, however, that if aqueous MeHg concentrations decline, a decline in biotic concentrations will follow. The same conclusion could be drawn if staff had recalculated the water-invertebrate correlation after separating Slotton's data between main stem and nearby-mine sites.

Although possibly unclear in the TMDL report, the aqueous methylmercury goal for Cache Creek was derived using data that were not collected immediately downstream of mines. The correlation between MeHg in large fish and invertebrates could only use data from sites at which large fish were present (Fig. 4-2 of the TMDL report). These sites were North Fork Cache Creek; Cache Creek at the Cache Creek dam, Rumsey, and Yolo, and upper Bear Creek. Targets for Harley Gulch, Sulphur Creek, and Bear Creek (including downstream of mine inputs) were determined separately from the main stem Cache Creek.

Based on comments received from Dr. Slotton after the peer review, staff revised the linkage analysis using a single methylmercury relationship (large fish to water) for Cache Creek, rather than the two relationships (large fish to invertebrates and invertebrates to water). The text of the Basin Plan Amendment staff report shows the new linkage and has been clarified to explain that aqueous methylmercury goals for Harley Gulch, Cache Creek, and Bear Creek were calculated using site-specific data. (Although the Bear Creek methylmercury goal was determined separately, it was the same as the original Cache Creek goal because of the analytical detection level limits).

<u>Comment # 3. Dissolved versus Total MeHg</u>
Dr. Sedlak suggests that dissolved MeHg may be a more appropriate parameter than unfiltered MeHg for the linkage between aqueous and biotic MeHg.

Staff agrees that of the correlations (Slotton *et al.*, 2004) between aqueous and invertebrate MeHg, the relationship between MeHg in filtered water and invertebrates was the most statistically significant (R2 = 0.682). The correlation between MeHg in unfiltered water was slightly less significant (R2 = 0.625). The revised linkage relationships (see response above) also use unfiltered water data. Staff selected the correlations that used MeHg concentrations in unfiltered water for several reasons.

1. Although the correlation between MeHg in filtered water and invertebrates was highly positive when data from multiple sites were plotted together, the correlations weakened when sites were examined individually. The relationship between MeHg in unfiltered water and biota was the only one that had positive correlations for individual sites and grouped data. For the linkage analysis, staff sought the most robust relationship involving MeHg, as indicated by consistency and statistical significance.

2. As Dr. Sedlak suggests, it is possible that the relationships between MeHg in filtered water and biota at individual sites were not positive because so many of the concentrations in filtered water are at or below the current limit of detection (around 0.02 ng/L for two laboratories at the forefront of mercury analysis). Having a significant relationship for unfiltered water and a limited sampling budget, it seemed reasonable to set goals in unfiltered water.

3. By use of the unfiltered water-invertebrate correlation and selection of goals in unfiltered water, staff was not attempting to describe the most likely mechanism of bioaccumulation. Slotton and colleagues (2004) found highly significant correlations between concentrations of MeHg in filtered and unfiltered water. Because concentrations in unfiltered and filtered water covary, it is not possible to evaluate the roles of particle-bound (size >0.45 micron), colloidal, and truly dissolved MeHg in uptake with this type of sampling. Because they do covary,

however, staff expects that by sampling unfiltered MeHg, staff can track decreases in the most bioavailable fraction and subsequent declines in biota.

If MeHg concentrations biomagnify through a food web involving phytoplankton, the use of unfiltered water data may be highly appropriate to link to concentrations in higher trophic level fish. MeHg absorbed by phytoplankton would not be detected in a filtered sample. Slotton and coworkers collected data monthly or bimonthly for 18 months. In periods with little precipitation and associated runoff, much of the filterable MeHg may have been absorbed by algae or attached to dissolved organic matter rather than attached to sediment particles (Gary Gill of Texas A& M University found MeHg binds preferentially to organic matter over non-organic particles).

4. Regional Board staff has collected some filtered aqueous MeHg in Cache Creek, the Delta, and the Sacramento River. Staff has limited collecting filtered data because: a) the increases in personnel time to filter and analytical costs are substantial, b) many samples are below the limit of detection, and c) the standard 0.45 micron filter passes both colloidal and dissolved MeHg, which likely have different roles in bioaccumulation.

<u>Comment # 4. Possible bias associated with the use of Total (raw) MeHg</u>
Dr. Sedlak noted that aqueous concentrations of unfiltered MeHg and total suspended solids (TSS) are correlated at some sites. Monitoring for unfiltered MeHg could introduce a bias against sites with high TSS, as particle-bound MeHg is likely less bioavailable than dissolved MeHg.

Dr. Sedlak raised an interesting point about the apparent correlation between total aqueous MeHg and total suspended solids (TSS). Staff examined the relationships between MeHg and TSS at other sites and seasonal patterns.

Although these relationships exist, staff does not believe that the aqueous MeHg goals were determined with a bias to high TSS sites or events. The aqueous MeHg goals are defined as annual average concentrations. Slotton and colleagues collected samples in dry and wet (high runoff and TSS) periods. Staff also does not intend that future monitoring to evaluate attainment of the aqueous goals be targeted to high flow events. Monitoring should be conducted periodically throughout the year during different flow regimes and seasons.

Regional Board staff hopes to refine the methylmercury linkage analysis to reduce such uncertainties as effects of high TSS and the debate over filtered versus unfiltered samples. Refinement may come as part of adaptive management for the Cache Creek watershed or for TMDLs in other water bodies. For the mercury TMDL for the Sacramento-San Joaquin River Delta, sufficient data were available to examine the linkage using MeHg data collected in warm weather months, during which time aquatic organisms are more active and more bioaccumulation of mercury may occur.

Comment # 5.MeHg Budgets

Dr. Sedlak suggested recalculating MeHg budgets by considering high and low water flow periods separately.

Dr. Sedlak suggested that MeHg loads be calculated by separating flow into wet and dry periods and multiplying by average MeHg concentration of samples collected only within the respective period (Categories of "wet" and "dry" might be more descriptive than "high flow" and "low flow", as summer releases from the dams can produce flows equivalent to moderate precipitation-induced flows above Yolo). This reanalysis of MeHg loads would be very appropriate when there is more MeHg data from the Cache Creek watershed and a better understanding of the fate of MeHg present in the "wet" and "dry" periods.

Staff agrees that at all of the main Cache Creek sites, existing data show average MeHg concentrations that are higher in the wet periods than in dry. Differences in the wet and dry concentrations for each site were not statistically significant (compared by t-test). The differences may be due, in part to lack of data in late summer, when methylation rates are likely to be high. Few samples were collected in July and September.

By combining all methylmercury concentration data to obtain an annual average, Regional Board staff may have underestimated the total methylmercury loads in the Cache Creek. In particular, loads may have been underestimated in runoff events. Staff is uncertain whether biotic methylmercury exposure and accumulation during high winter flows is different from summer flows. Use of the annual average MeHg concentration to calculate loads seemed the most appropriate, given uncertainties and to best use the data available. Although total loads may be underestimated, the intent of the load allocations is to reduce concentrations of methylmercury affecting biota.

Comment #6. Minor editorial comments

Dr. Sedlak recommended better use of significant figures, clarification of compliance with the California Toxics Rule (CTR), and use of "methylation" instead of "methylization".

We agree that four significant figures were inaccurate. Our use of significant figures was reviewed and adjusted in the BPA Staff report. Use of "methylization" has been corrected.

The Basin Plan Amendment clarifies that the CTR is an applicable water quality standard that must be met by the TMDL. The implementation plan focuses on reducing erosion from areas most enriched in mercury. Reducing inputs from these areas should decrease the concentrations of mercury in storm flows. If interpreted with a once-every-three-years exceedance, meeting the CTR in Cache Creek would be difficult. Cache Creek will continue to be monitored to determine compliance with all applicable standards. In the future, it is possible that the CTR could be replaced with a standard for methylmercury. As described in the Basin Plan Amendment staff report, Regional Board staff considers a fish tissue objective to be more protective of humans eating fish and drinking water. Dr.

Sedlak is correct that there are no drinking water intakes in these creeks. In practical terms, staff does not expect that people would drink water with storm-level concentrations of mercury and suspended solids. Solids should be filtered or allowed to settle during treatment before delivery of drinking water.